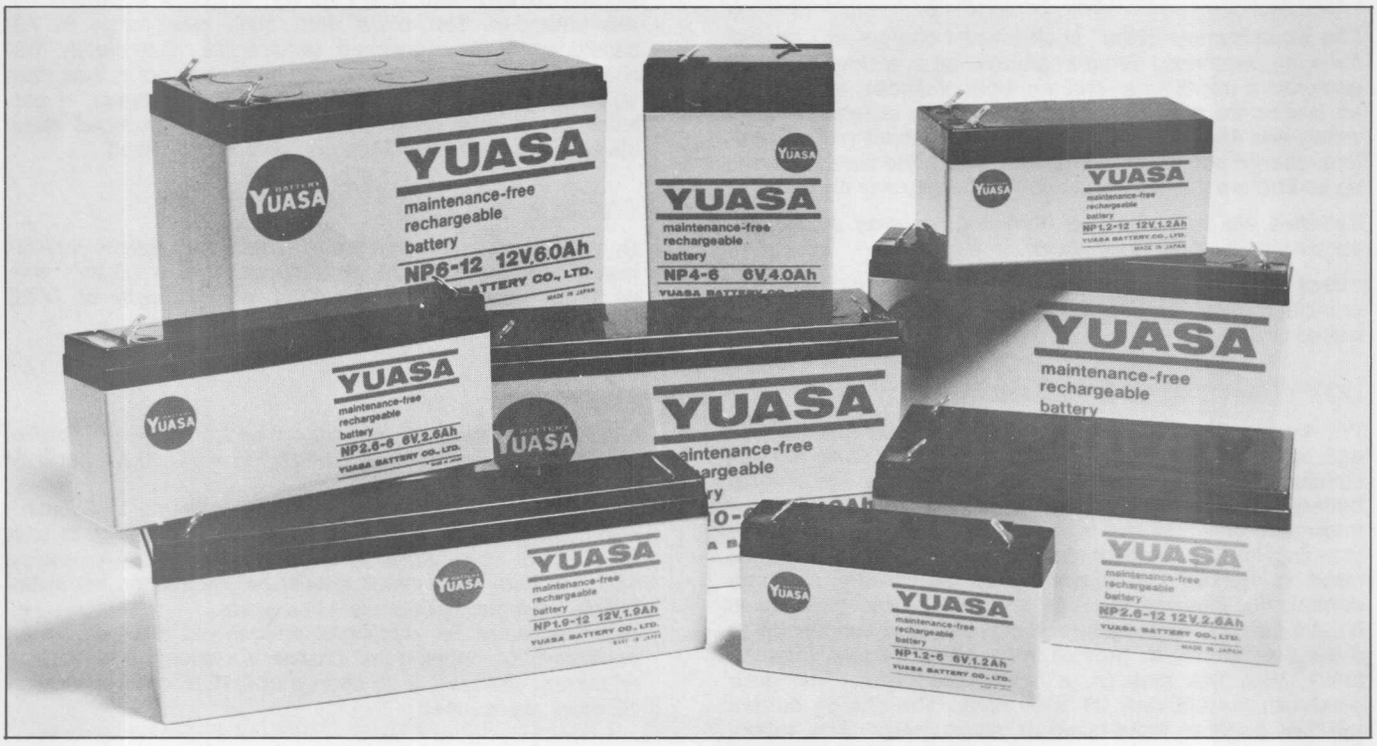
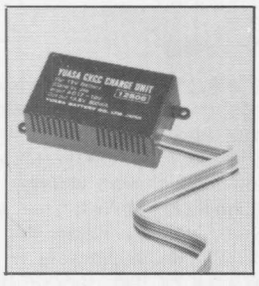
789-2010 HEATHER ANDERSEN

5th Edition

APPLICATION MANUAL

YUASA NP sealed maintenance-free rechargeable batteries





TECHNICAL FEATURES

1. Totally Sealed	- no leakage, spillage or gassing - no maintenance or topping up
2. Liquid Electrolyte	- immobilized liquid, no gel, for greater performance - no inhibiting jellies or contaminants - do not dry out or open circuit - limited electrolyte, not "flooded"
3. Standby or Cyclic Service	- one type only for either duty - wider application
4. No Memory Effect	- delivers full capacity when required - requires no special conditioning
5. Heavy Duty Grids	- "Third generation" construction utilising advanced calcium alloying techniques - reduced gassing and internal electrolytic corrosion - long life, extra margin of performance
6. Separators	- thick fibrous absorbent fibreglass mats wrapped around plates - efficient insulation between plates, with high ionic permeability - positive retention of active material - reduced self-discharge rate - capillary action prevents stratification
7. No Gassing	- sealed construction, unique control of gas generation and recombination - new safety venting system prevents damage in abnormal circumstances
8. Cases	- high impact ABS resin does not crack or leak
9. Useable in any position	
10. High Power Density	- One type for standby or cyclic applications
11. Deep Cycling	- Superior recoverability after prolonged deep discharge - Over 1 200 cycle life
12. Float Charge	- No "boost" rate required in standby applications

DEFINITIONS

"C" or "CA" is the rated capacity of the battery expressed in Amps. For example for type NP65–12, "C" or "CA" is 65 Amps. Therefore C/10 or 0.1CA is 6.5 amps, etc. "V.P.C." means volts per cell.

CHARGING METHODS

The worst battery "Killer" is an inferior charger or incorrect charging methods. Simple garage type trickle chargers comprise a transformer and a couple of diodes, and usually an inaccurate ammeter. Applied charging voltage will vary widely and final charge current will be relatively high. Therefore, charge should be terminated before the battery warms up and before the high ripple current can do any harm.

Batteries are fully charged from a completely discharged state normally in 12 to 20 hours.

Yuasa batteries are capable of accepting very high starting, or initial charge currents (2CA) but normally these would be limited to 0,25CA.

CONSTANT VOLTAGE CHARGING

We recommend this method. A well regulated applied voltage, set for the NP battery operating temperature is most suitable either for cyclic or float applications. For longest battery life, the initial charge current should be limited to the maximum given in the specification table. If there is a standing load, on the output side, the rectifier should be rated to handle this current plus the battery recharge current. For intermittent loads, the rectifier can be rated to handle peak current loads, or it may be more economical to allow the battery to provide high current drains intermittently. With this method, a discharged battery will draw maximum current until its EMF rises. The charge current will then begin to taper down to trickle charge. The battery will then only absorb current to compensate for internal losses. Constant voltage current controlled chargers are known as C.V.C. chargers.

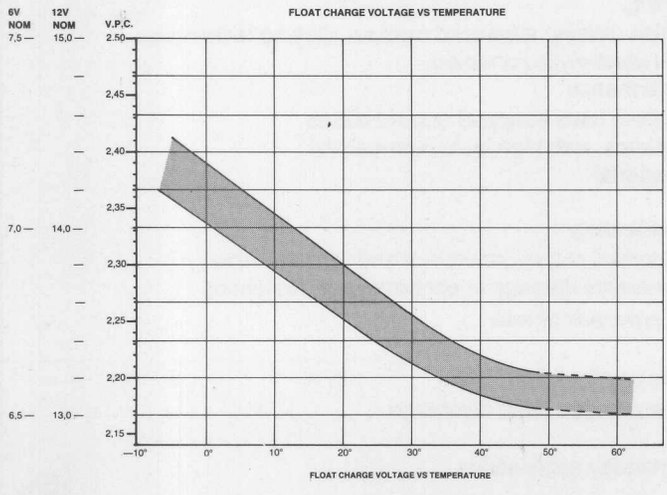
CYCLIC SERVICE CHARGING

Using the constant voltages in the table below, when the cell voltages reach not more than 2,50V per cell (V.P.C.) reduce the applied voltage to the "float" rate voltage, or automatically terminate the charge cycle, by sensing the charge current decrease at end of charge.

Battery Temperature vs Charging Voltage	
Temperature °C	Cyclic Service Charging Voltage (VPC)
5	2.48 to 2.54
15	2.47 to 2.52
25	2.40 to 2.50
35	2.36 to 2.46
45	2.32 to 2.42

FLOAT OR STANDBY SERVICE CHARGING

Use the voltages given in the graph below:—



CONSTANT CURRENT CHARGING

This method is suitable to restore a known ampere-hour charge into a previously discharged battery or when the recharge time is critical. It is necessary to monitor the charge termination point either manually or timed automatically, in order to prevent battery over-charge. Over-charging is the biggest danger with this method, which is therefore not recommended. Not more than 10% overcharge in AH should apply for maximum service life. Completely discharged batteries should not be fully charged in less than 10 hours. For recovering over-discharged batteries, or batteries which have been left standing in a discharged state, the C.C. method at the 72 hr rate should be utilised.

TRICKLE CHARGING

By definition this is the charge required to restore internal losses only (not to recharge batteries) and is 0,5 to 1 milliamps per ampere hour of battery rated capacity or .002C amps to .004C amps and is not a "float" charge.

EQUALIZING CHARGE

It is important that batteries for connection in series-parallel configurations should be equalized to within 0,3V per 12V battery.
An equalizing charge should be applied to any 12V battery with open circuit voltage of less than 12.6V. Charge at 14.4 to 14.7V for 10 to 20 hours and retest. Any battery reading 12.3V or less open circuit should be cycled and equalized before attempting to include it in a group.
Batteries stored for prolonged periods will also require an equalizing, or "topping-up" charge. An alternate method of equalizing charging, is to charge at 0.1CA for between 4 & 10 hours, as required.

TWO RATE CHARGING

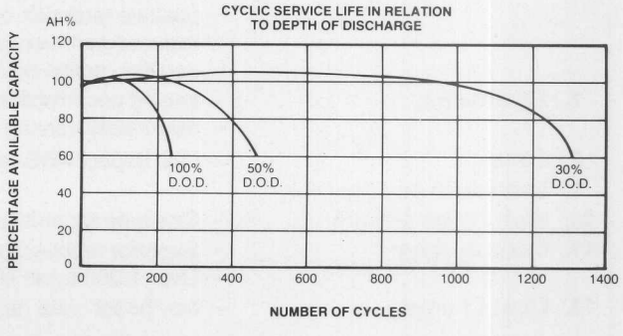
In the first part of the recharge period while the battery is in a low state of charge, the charging rate starts at a high current. When the cells approach a state of full charge, the current is switched back to a low finishing rate, or preferably to the regulated float charge voltage. The switch-down point should be sensed when the state of charge approaches 80% i.e., usually when the voltage reaches 2.45V.P.C. (at 20°C). Voltage sensing is preferable to the use of a timer, in view of the danger of high rate overcharge.

	Starting	**Finishing**
Charge current:	0,25CA to 1,0CA	0,04CA to 0,08CA
Charge voltage:	2,40VPC to 2,55VPC	2,25VPC to 2,30VPC

For a fully charged battery at the correct float charge voltage, the charge current should be between 0,002CA and 0,004CA.

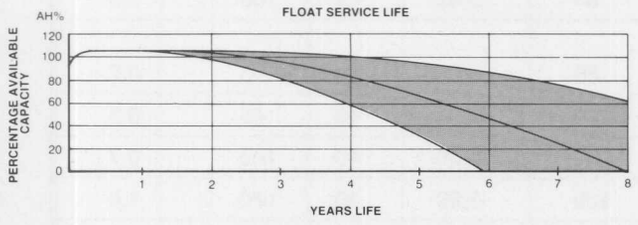
CYCLIC SERVICE LIFE

Several factors affect cyclic life, including depth of discharge, to which life is inversely proportioned, as shown in the graph below. Selection of battery capacity to minimise depth of discharge (D.O.D.) is therefore advantageous. A new battery gives maximum capacity during its initial 50 cycles.



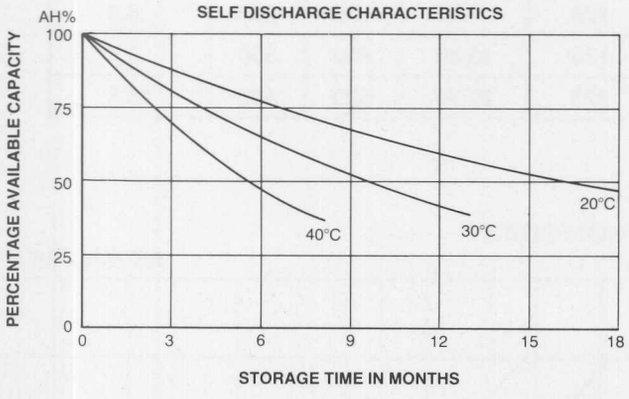
FLOAT SERVICE LIFE

This is affected by temperature, number of discharge cycles, depth of discharge and especially the float voltage. Longest life is achieved between 20°C and 25°C.
Yuasa NP batteries can have a float service life of 8 years as shown on the graph below, showing good, average and poor conditions.



SELF DISCHARGE CHARACTERISTICS

Any rechargeable battery loses charge through internal losses. The ideal storage temperature if 0°C, when all ionic action is retarded. However, the "shelf" life of NP batteries is exceptionally good, but it is recommended they be charged every 6 months.



SERIES/PARALLEL CONNECTION

Any number of NP-batteries can be connected in parallel strings, of equal numbers of batteries in series, to achieve higher capacities. The batteries should be spaced only to permit air circulation for convection cooling purposes, and elementary precautions should be taken in the layout to avoid the danger of short circuits between terminal posts and metal racks or frames. The former is important when high DC voltages are employed. Equal lengths of uniform cable of sufficient gauge must be used between tiers, strings and load. Batteries should always be fuse protected, as close to an offtake terminal as possible. Yuasa do not specify any special circuitry in parallel configurations e.g., voltage equalizing ladders, by-pass diodes etc, etc.

CONSTANT WATTAGE DISCHARGE

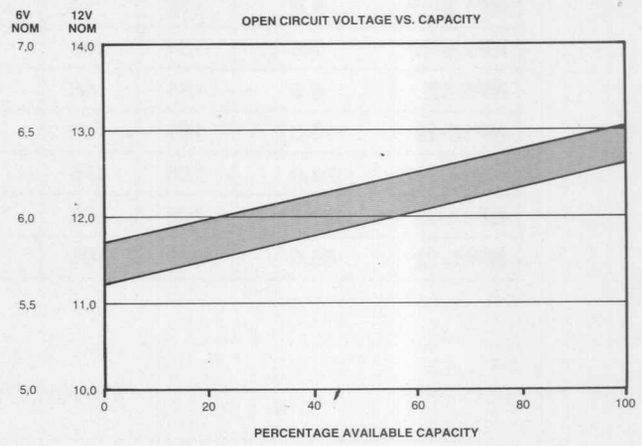
The constant load curves overleaf show the constant wattage at which **one** of the batteries shown can be discharged, for the periods indicated. The wattage from a battery system will be in **multiples** of this figure, firstly for the number of batteries in series, and then for the number of batteries in parallel. This will derive the total discharge wattage for a battery system e.g. two pairs in parallel will deliver **four** times the power of one battery.
Detailed selection charts for various system nominal voltages are available.

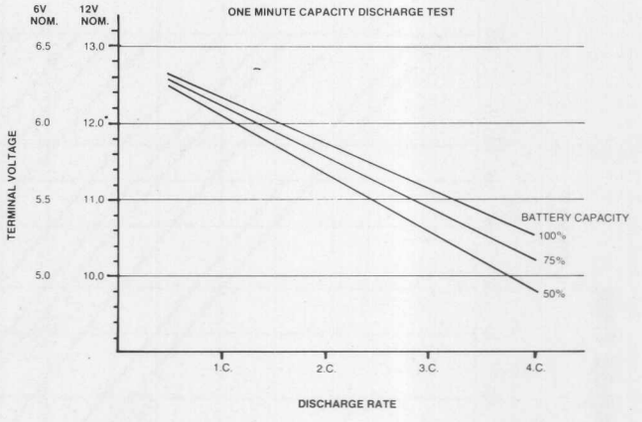
STORAGE OF NP BATTERIES

Yuasa NP batteries have good charge retention characteristics — better than other types of lead-acid batteries and far superior to nickel-cadmium cells. The lower the storage temperature the less the self-discharge of any battery. The ideal storage temperature is 5°C when no internal reaction (hence capacity leakage) takes place. Therefore the battery should be stored in as cool a store as is available, away from direct sunlight. NP batteries are fully charged when delivered, however they should be recharged every 9 months to maintain "as new" condition. Batteries must NOT be stored in a discharged state.

BATTERY CAPACITY MEASUREMENT

The open circuit voltage of a battery will give some indication of its state of charge. The only true test of rated capacity is the 20 Hr discharge rate. As this is impractical, shorter periods at higher rates of discharge can be used. The graph below is for a one minute test at 1C, 2C, 3C or 4C constant discharge rates. After exactly one minute at one of these discharge rates, read the load voltage of the battery. From the graph the approximate capacity of the battery can be read off.





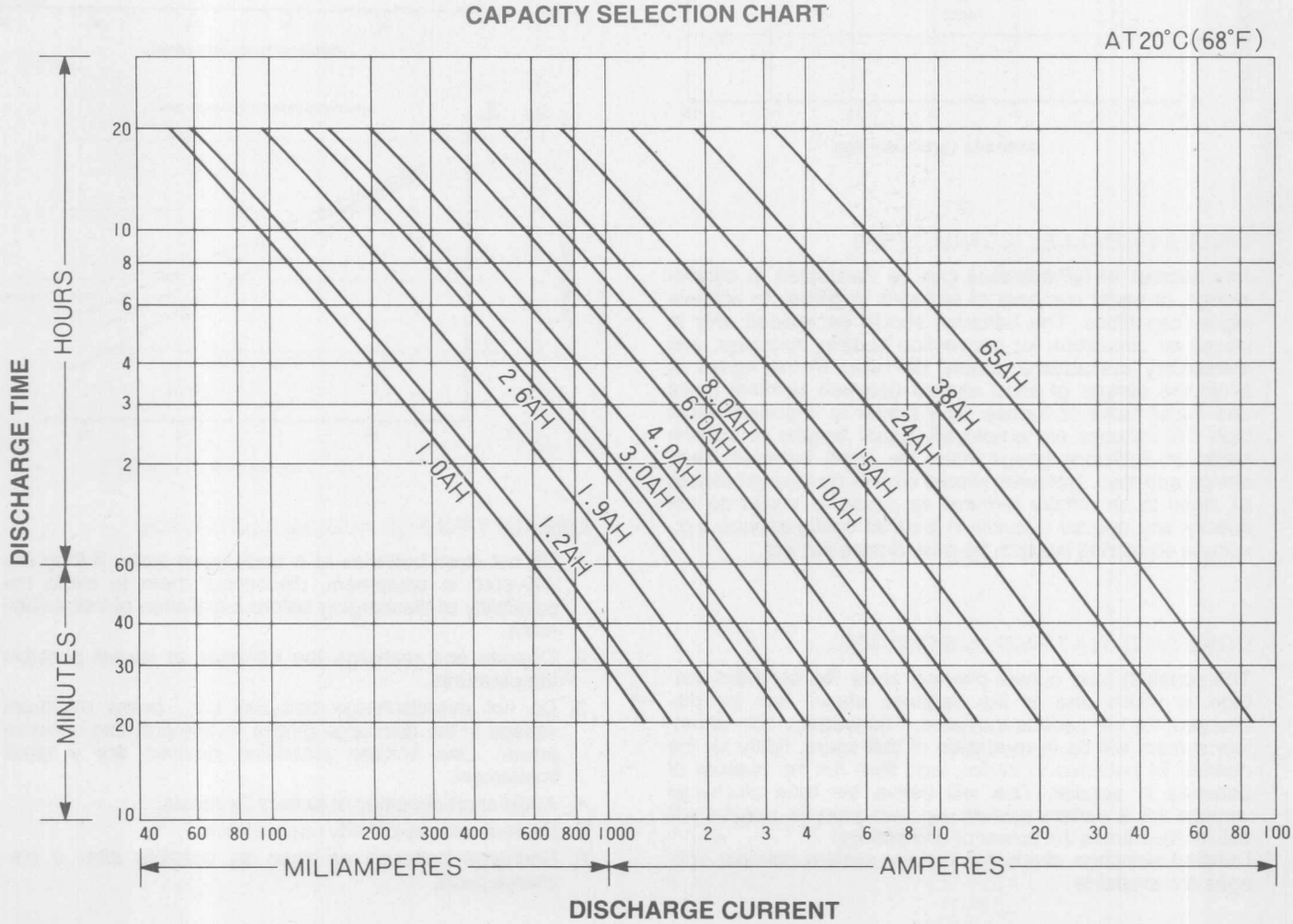
DESIGN TIPS FOR MAXIMUM SERVICE

1. Do not store batteries in a discharged state. If they are delivered in equipment, disconnect them to avoid the possibility of discharging before installation of that equipment.
2. Operate and recharge the batteries at lowest possible temperatures.
3. Do not overdischarge batteries (i.e., below minimum voltage in the discharge graph) — this provides no extra power. Low voltage protection devices are a good investment.
4. Avoid short-circuiting of battery terminals.
5. Beware reverse polarity connections.
6. Recharge batteries as soon as possible after a discharge cycle.

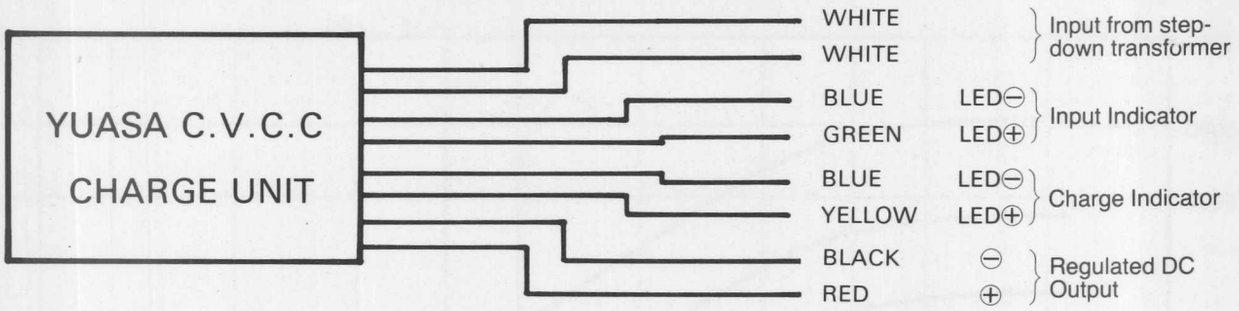
YUASA NP BATTERY SPECIFICATIONS

TYPE	CAPACITY	DIMENSIONS				WEIGHT	MAX DISCHARGE		RECHARGE
	"C" at 20 Hr Rate A.H.	L ± 1mm	W ± 1mm	Container Height ± 1mm	Overall Ht over lugs ± 3mm	Approx. Kg	Standard Amps	Short Duration Amps	Maximum Initial Current Amps
4 VOLT									
NP3-4	3,0	91	34	60	64	0,43	40	100	1,0
6 VOLT									
NP1-6	1,0	51	43	51	58	0,25	40	45	0,2
NP1,2-6	1,2	97	25	51	58	0,34	40	45	0,3
NP2,6-6	2,6	134	34	60	67	0,60	40	100	0,7
NP4-6	4,0	70	47	102	109	0,90	40	120	1,0
NP6-6	6,0	151	34	96	103	1,25	40	180	1,5
NP10-6	10,0	151	50	96	103	2,20	40	300	2,5
12 VOLT									
NP1,2-12	1,2	97	48	51	58	0,59	40	45	0,3
NP1,9-12	1,9	178	34	60	67	0,90	40	75	0,5
NP2,6-12	2,6	134	67	60	67	1,10	40	100	0,7
NP6-12	6,0	151	65	96	103	2,40	40	180	1,5
NP15-12	15,0	181	76	167	167	5,00	100	400	4,0
NP24-12B	24,0	166	175	125	125	7,70	150	500	6,0
NP38-12	38,0	198	166	170	170	13,80	200	500	9,5
NP65-12	65,0	350	166	175	175	22,70	500	800	16,5

CAPACITY SELECTION CHART



CVCC CHARGER MODULE WIRING DIAGRAM



YUASA CVCC CHARGER SPECIFICATIONS

Reverse polarity proof.
Short Circuit Proof
Current limiting, regulated charge voltage
Output drives for L.E.D.'s for mains "on" and charge "on"
Louvred plastic case with ribbon cable fly lead.

	6 VOLT		12 VOLT	
Application	Standby	Cyclic	Standby	Cyclic
Type Ref.	06S08	06C08	12S06	12C06
Output Voltage, DC Preset, adjustable	6.9V	7.4V	13.8V	14.8V
AC Input Voltage	11 — 13V AC (15VA)		17 — 19V AC (20VA)	
Output Current (Maximum)	800 mA		600 mA	
Dimensions	78 x 45 x 25 mm			
Operating Temperature	0 to 45°C			
Charge Indication L.E.D. Cut-Off Current	Between 70 and 100 mA			
Applicable Battery Capacity	Up to 10 AH			

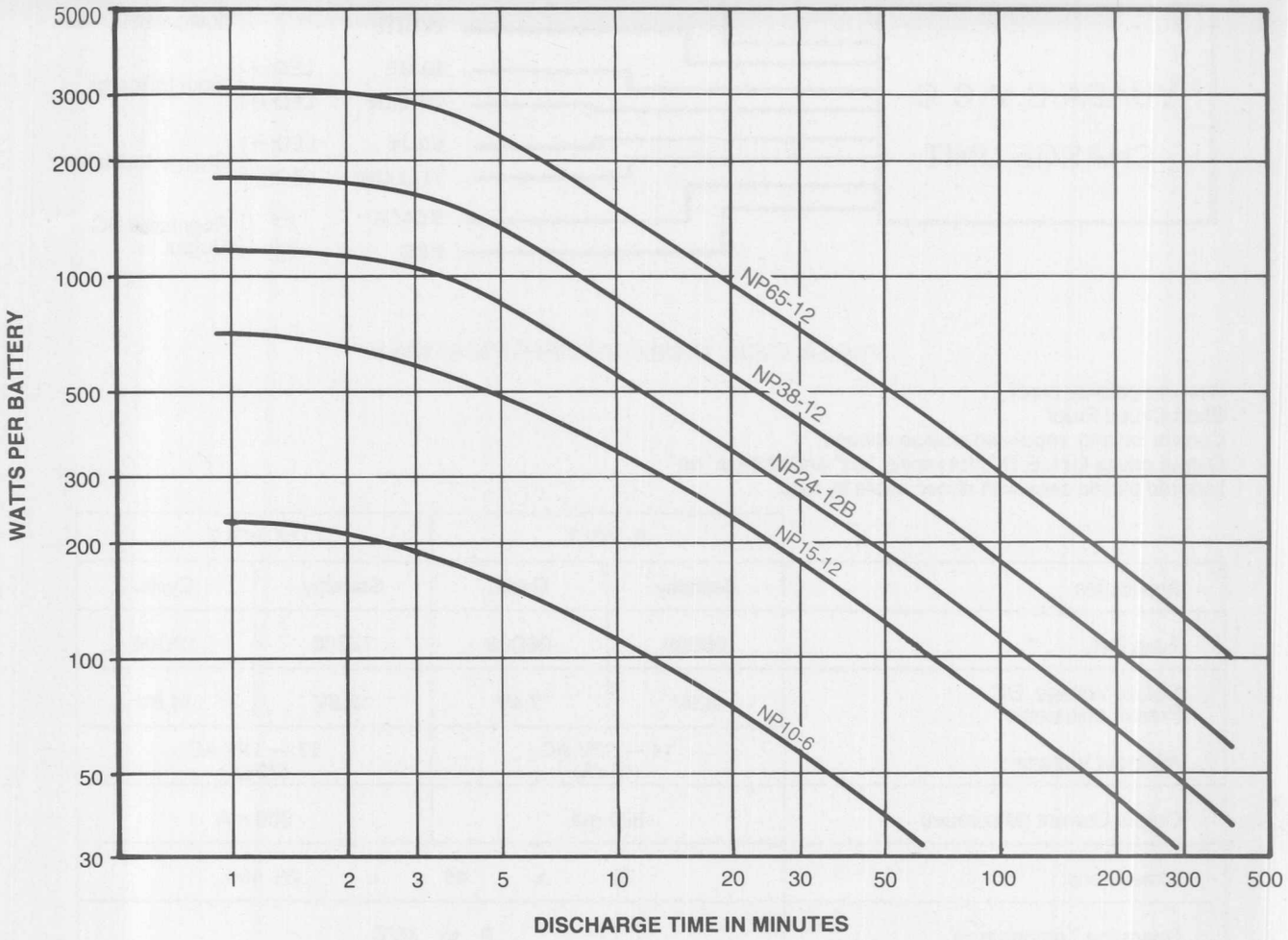
SEE PHOTOGRAPH ON FRONT PAGE

Battery Guarantee

1. Yuasa "NP" series lead acid batteries which are sold are warranted against defects in workmanship or materials for a period of 12 calendar months from date of delivery, providing installation and operation is carried out in accordance with our recommendations.
2. Batteries that have been over-discharged, left in a discharged condition, severely overcharged or abused or misused are not covered under any warranties.
3. Our obligation shall be limited to the refund of the cost, or the replacement F.O.B. our works, at our discretion, of any battery returned prepaid for examination and which is found to be defective or damaged on delivery to the buyer, to our satisfaction.
4. We accept no liability for any injury, loss, damage, incidental, contingent or consequential expenses incurred, directly or indirectly, with respect to any defective battery, or any battery misused.
5. There are no other warranties, whether expressed or implied of merchantability or suitability of application or otherwise except the warranty expressly stated herein.

available from:—

CONSTANT LOAD DISCHARGE CURVES
(At 25°C to 1.6V.P.C.)



DISCHARGE CURVES
VOLTAGE VS. DISCHARGE RATE AND TIME